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Dividends From Wood Research

Recent Publications
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CURRENT SERIAL RECORDS

adhesives

1. Behavior of Construction Adhesives Under Long-Term Load

River, Bryan H. and Robert H. Gillespie

USDA For. Serv. Res. Pap. FPL 400, 1981

The study reported here investigates effects of temperature and time on rigidity of construction adhesives.

2. Emission of Formaldehyde by Particleboard: Effect of Ventilation Rate and Loading on Air-Contamination Levels

Myers, George E. and Muneo Nagaoka

Forest Products Journal 31(7): 39-44, 1981

The authors illustrate the potential of one equation to evaluate the degree of improvement required for a particleboard to meet permissible air contamination levels and to evaluate the utility of a board under various ventilation rate and loading conditions.

3. Investigation of Urea-Formaldehyde Polymer Cure by Infrared

Myers, George E.

Journal of Applied Polymer Science 26: 747-764, 1981

The authors examine here the capability of conventional infrared analysis to define the structure of UF polymers in the cured, crosslinked state.

anatomy & properties

4. Comparison of Mechanical and Anatomical Properties of Eastern Cottonwood and *Populus* Hybrid NE-237

Bendtsen, B. Alan, Robert R. Maeglin,
and Frederick Deneke

Wood Science 14(1): 1-14, 1981

This investigation compares certain anatomical and mechanical properties of a *Populus* clone hybrid widely grown in Nebraska to those of native cottonwood grown in the same area.

5. Bacteriological, Chemical, and Physical Properties of Wetwood in Living Trees

Ward, J. C. and J. G. Zeikus

From: Natural Variations of Wood Properties, Proceedings International Union of Forest Research Organizations, Working Party S.5.01-02, pp. 133-165, 1981

Properties of wetwood are discussed as they differ from normal heartwood and as they may be affected by microbial activity.

6. Semiautomated Recording of Wood Cell Dimensions

Quirk, J. T.

Forest Science 27(2): 336-338, 1981

The FPL electromechanical, length-measuring device allows large volumes of highly precise anatomical measurements of wood to be made rapidly. Sonic measuring equipment, recording equipment, and computer programs for data processing are described and system performance evaluated.

7. Wood Composites

Marra, George G. and John A. Youngquist

Chemtech July 1981, pp. 418-421

The authors discuss wood's structure including hygroscopic and viscoelastic properties and strength and chemistry at the fiber and molecular level.

8. Influence of Electrode Design on Measurements of Dielectric Properties of Wood

James, William L.

Wood Science 13(4): 185-198, 1981

This study obtained basic data on the interaction of both electrode design and electric field geometry with other important variables as they influence the measured dielectric properties of wood.

9. Wood Anatomy of the Neotropical Sapotaceae

Kukachka, B. F.

USDA For. Serv. Res. Pap. FPL 371-374 and 395-398, 1981

The homogeneous nature of the floral characteristics of the tree family Sapotaceae makes generic identification extremely difficult. This paper offers information to help utilize Sapotaceae timber through clearer species identification.

On the basis of their anatomy, Dr. Kukachka has suggested numerous divisions. Seven were published in 1978, six in 1979, six in 1980, and the following eight this year. Each species is

"Dividends From Wood Research" is a semiannual listing of recent publications resulting from wood utilization research at the Forest Products Laboratory. These publications are made available to the public to encourage private and commercial application of Forest Service

research. The Forest Products Laboratory is maintained in Madison, Wisconsin, by the Forest Service, U.S. Department of Agriculture, in cooperation with the University of Wisconsin.

discussed in a separate research paper under the main heading of "Wood Anatomy of the Neotropical Sapotaceae" and a specific number subhead:

- | | |
|---------------------------|----------------------------|
| XX. Manilkara (FPL 371) | XXIV. Ecclinusa (FPL 395) |
| XXI. Barylucuma (FPL 372) | XXV. Ragala (FPL 396) |
| XXII. Pradosia (FPL 373) | XXVI. Myrtiluma (FPL 397) |
| XXIII. Gayella (FPL 374) | XXVII. Sarcaulua (FPL 398) |

buildings & construction

10. Proposed Streamlined Residential Heating Energy Budget Analysis by a Variable Temperature Design Method

Hans, Gunard E.

From: Thermal Performance of the Exterior Envelopes of Buildings, Conference, American Society for Heating, Refrigerating, and Air Conditioning Engineers, Inc., New York, pp. 16-32, 1981

A proposed method for residential heating load calculations is introduced based on recognition of variable reference temperatures instead of traditionally fixed indoor "design" temperatures.

11. Trends in Lumber Used for Housing

Marcin, Thomas C. and Henry Spelter

From: Metal Plate Wood Truss Conference, Forest Products Research Society, Madison, Wis., pp. 173-180, 1981

The authors trace general wood use trends in the last thirty years of residential construction. They conclude that better lumber utilization through improved truss-frame systems would enhance wood's competitive position with other materials.

chemistry

12. Potential Applications of Bio-ligninolytic Systems

Kirk, T. Kent and Hou-Min Chang

Enzyme Microb. Technol. 3: 189-196, 1981

This paper reviews and attempts to evaluate the potential uses for the lignin-degrading systems of certain microorganisms. These uses include production of cellulosic and lignin products, conversion of lignocellulose into feed and food, and treatment of lignin-derived waste.

13. Biosynthesis of the Secondary Metabolite Veratryl Alcohol in Relation to Lignin Degradation in *Phanerochaete chrysosporium*

Shimada, Mikio, Fumiaki Nakatsubo, T. Kent Kirk, and Takayoshi Higuchi

Arch. Microbiol. 129: 321-324, 1981

Examination of the ligninolytic activity of *Phanerochaete chrysosporium* cultures establishes that initial degradative reactions are paralleled by the final reactions in veratryl alcohol biosynthesis. The authors also demonstrate that veratryl alcohol biosynthesis and lignin model compound degradation share cinnamyl alcohol-transforming reactions.

14. New Triterpenes from the Bark of Western White Pine (*Pinus monticola* Dougl.)

Kutney, James P., Gunter Eigendorf, Brian R. Worth, John W. Rowe, Anthony H. Conner, and Bhimsen A. Nagasampagi

Helvetica Chimica Acta 64(4): 1183-1207, 1981

In this detailed examination of the extractives of western white pine, eleven new triterpenes with the lanostene-type skeleton were isolated from the benzene extract. Their structures were determined mainly on the basis of physical and spectral data.

15. Conversion of Xylose to Ethanol Under Aerobic Conditions by *Candida tropicalis*

Jefferies, T. W.

Biotechnology Letters 3(5): 213-218, 1981

This study determined that the production of ethanol by *Candida tropicalis* accelerates with increased aeration, addition of xylose to active cultures, and serial subculture in a medium containing xylose as a sole carbon source.

16. 30-Nor-3 β -methoxyserrat-14-en-21-one: First Reported Natural Occurrence of a Norserratene Triterpene

Conner, Anthony H., Tuli P. Haromy, and Muttaiya Sundaralingam

Journal of Organic Chemistry 46: 2987-2988, 1981

During research on western white pine bark, a new triterpene was isolated. Its structure is described in this report.

degradation & protection

17. Exterior Weathering Durability of Some Leach-Resistant Fire-Retardant Treatments for Wood Shingles: A Five-Year Report

Holmes, Carlton A. and Ronald O. Knispel

USDA For. Serv. Res. Pap. FPL 403, 1981

This publication reports on a continuing FPL study on outdoor durability of several fire-retardant treatments for wood shingles.

18. Fungicides to Prevent Sapstain and Mold on Hardwood Lumber

Cassens, Daniel L. and Wallace E. Eslyn

Forest Products Journal 31(9): 39-42

The authors present results of screening tests to determine how effective selected fungicides less toxic than sodium pentachlorophenate are in preventing fungal stain and mold on hardwood lumber.

19. Marine Exposure of Preservative-Treated Small Wood Panels

Johnson, Bruce R. and David I. Gutzmer

USDA For. Serv. Res. Pap. FPL 399, 1981

Since 1969, combinations of preservative type, quality, and quantity have been used on southern pine panels suspended below low tide level. Results reported here are the third and final set from the initial Florida work site.

20. Groundline Treatments of Southern Pine Posts

DeGroot, Rodney C.

USDA For. Serv. Res. Pap. FPL 409, 1981

This paper presents a final interpretation of results from a twenty-two year study on the relative performance of groundline treatments of utility poles available in 1957.

21. Preservative-Treated Wood for Foundations

DeGroot, Rodney C., Lee R. Gjovik, and Andrew J. Baker

USDA For. Serv. Res. Note FPL 0245, 1981

The authors outline general information concerning use of preservative-treated wood in foundations, including treatment standards and preservative evaluation.

22. The Taxonomy of *Sporotrichum pruinosum* and *Sporotrichum pulverulentum*/*Phanerochaete chrysosporium*

Burdsall, Harold H. Jr.

Mycologia 73(4): 675-680, 1981

This work demonstrates that *Sporotrichum pulverulentum* is a life stage of *Phanerochaete chrysosporium*. *Sporotrichum pruinosum* and *P. chrysosporium* were confirmed as distinct.

23. Reliability Analysis of a Fire-Exposed Unprotected Floor Truss

Schaffer, E. L. and F. E. Woeste

From: Metal Plate Wood Truss Conference, Forest Products Research Society, Madison, Wis., pp. 131-137, 1981

This paper illustrates a risk-based methodology and its application to assessing the fire-endurance safety of an unprotected, light-frame, floor-truss assembly.

24. Weathering of Chemically Modified Southern Pine

Rowell, Roger M., William C. Feist, and W. Dale Ellis

Wood Science 13(4): 202-208, 1981

This study examined the effectiveness of cell wall chemical modification and polymer lumen fill treatments, separately and combined, in reducing the degradative effects of weathering on wood.

25. Cultural Studies on *Poria cinerascens*, *P. rivulosa*, and *P. subvermispora* (Aphylllophorales, Basidiomycotina)

Nakasone, K. K.

Mycotaxon 13: 105-111, 1981

This study was undertaken to resolve what is called the *P. cinerascens* culture complex.

design data

26. A Summary of Modulus of Elasticity and Knot Size Surveys for Laminating Grades of Lumber

Wolfe, R. W. and R. C. Moody

USDA For. Serv. Gen. Tech. Rep. FPL 31, 1981

Results will be helpful to organizations that prepare and evaluate specifications for glulam timber.

27. Wood Joist Floors: Effects of Joist Variability on Floor Stiffness

McCutcheon, William J., M. Daniel Vanderbilt,

James R. Goodman, and Marvin E. Criswell

USDA For. Serv. Res. Pap. FPL 405, 1981

The research reported here documents one aspect of the composite performance characteristics of wood-joist floor systems.

28. Oak-Cottonwood Plywood: No Delamination after Five Years

Jokerst, R. W. and J. F. Lutz

Plywood and Panel 22(1): 17-18, 1981

This report updates previous work and describes results for shear strength and percentage wood failure after five years exterior

exposure of 3-, 4-, and 5-ply panels made of combinations of eastern cottonwood and northern red oak 1/8-inch veneer.

29. Analysis of Continuous Beams with Joint Slip

Soltis, Lawrence A.

USDA For. Serv. Res. Note FPL 0244, 1981

This study presents a computer analysis method and input user guidelines to determine internal forces, reactions, and deflections of continuous beams with rotational slip at supports.

30. A Weibull Analysis of Wood Member Bending Strength

Liu, J. Y.

From: Failure Prevention and Reliability—1981, Francis T. C. Loo, ed., pp. 57-64, American Society of Mechanical Engineers, 1981

Analysis of size effect on bending strength of rectangular wood beams based on Weibull's theory of brittle failure has been expanded here to include tapered wood beams under arbitrary loading conditions.

31. An Incremental Finite-Element Determination of Stresses Around Loaded Holes in Wood Plates

Wilkinson, Thomas Lee, R. E. Rowlands, and R. D. Cook

Computers and Structures 14(1-2): 123-128, 1981

The objective of this investigation was to determine the stresses and strains around a single pin-loaded hole in a finite wood plate.

32. Influence of Elastic Properties on the Stresses in Bolted Joints in Wood

Wilkinson, Thomas L. and Robert E. Rowlands

Wood Science 14(1):15-22, 1981

The authors use developed and substantiated numerical analysis to determine the effects of elastic properties on the stresses associated with the single-fastener joint.

33. Analysis of Mechanical Joints in Wood

Wilkinson, T. L. and R. E. Rowlands

Experimental Mechanics 21(11):408-414, 1981

Presents the stresses around a bolt-loaded hole in tensile Sitka-spruce plates, and discusses the results relative to the formulation of rational design concepts for mechanical joints.

34. Compressive Strength of One- and Two-Ply Laminated Timbers

Moody, Russell C.

Forest Products Journal 31(5): 47-50, 1981

The effect on compressive strength of Douglas-fir laminated members is not known. This study provides the first step by defining the compressive strength of one- and two-ply members made from structural grades of lumber.

35. Strength and Stiffness of Small Glued-Laminated Beams with Different Qualities of Tension Laminations

Marx, Catherine M. and Russell C. Moody

USDA For. Serv. Res. Pap. FPL 381

This study was designed to provide data that will guide industry committees in recommending design stresses and specifications for shallow glulam beams.

36. Bending Strength of Shallow Glued-Laminated Beams of a Uniform Grade

Marx, Catherine M. and Russell C. Moody

USDA For. Serv. Res. Pap. FPL 380, 1981

The work presented here evaluated Douglas-fir beams using three current design criteria and developed a new method for determining appropriate design stresses for shallow beams.

37. Shear Strength of Tapered Wood Beams

Liu, J. Y.

Journal of the Structural Division, Proceedings of the American Society of Civil Engineers, ASCE, Vol. 107, No. ST5, May, 1981, pp. 719-731

This analysis provides a rational interpretation of size effects in shear and estimates allowable shear strength of tapered wood beams, provided they do not contain strength-reducing characteristics and appropriate values can be assigned for factors of safety, etc.

general

38. Population Change as Related to Long-Term Cycles in Residential Construction in the United States

Marcin, Thomas C.

USDA For. Serv. Res. Pap. FPL 392, 1981

Projections of household formations and housing demand are considered in this paper for their effects on long-term economic and population growth.

39. Trends and Patterns in Wood Products Consumption and Production

Risbrudt, Christopher and Robert N. Stone

From: Timber Demand—The Future is Now, Proceedings P-80-29, Forest Products Research Society, Madison, Wis., p. 24-34, 1981

Past and present trends in U.S. wood usage are reviewed in this paper and international comparisons are made.

40. Forest Products Research—Needs and Prospects (Thinking Globally—Acting Locally)

Youngs, Robert L.

From: Proceedings of the XVII IUFRO Congress, Kyoto, Japan, pp. 47-57

Outlined are research accomplishments and needs in the processing of wood and wood products, adhesives and adhesion, wood engineering, end-use classification, wood drying, and wood protection.

41. Finger-Jointed Wood Products

Jokerst, Ronald W.

USDA For. Serv. Res. Pap. FPL 382, 1981

This review of available literature on finger jointing of wood products indicates that information exists to produce strong, durable finger joints.

42. Opportunities for Utilization Research

Lindell, Gary R.

From: Land-use Allocation: Processes, People, Politics, Professionals, Proceedings of the 1980 Convention of the Society of American Foresters, pp. 294-298, 1981

This author discusses utilization research in terms of opportunities: for greater use of logging and mill residues; for greater use of hardwoods; for further recycling; for increasing product yields; for reducing actual timber demand by more efficient construction and improved product performance.

43. USA-column

Howard, James L.

World Wood 22(8): 35-36

This column from World Wood presents recent production figures for industrial roundwood lumber, softwood plywood, and particleboard. The outlook for U.S. forest products industries is also discussed.

packaging

44. Effect of Paperboard Stress-Strain Characteristics on Strength of Singlewall Corrugated Fiberboard: A Theoretical Approach

Urbanik, Thomas J.

USDA For. Serv. Res. Pap. FPL 401, 1981

Paperboard is characterized and related to the container's important performance requirement of short-term top-to-bottom compressive strength. Report is limited to balanced singlewall under ideal test conditions.

45. Overall Effective Thermal Resistance of Corrugated Fiberboard Containers

Bormett, David W.

USDA For. Serv. Res. Pap. FPL 406, 1981

This study of overall effective resistance of a corrugated fiberboard container considered several factors: board thickness, air velocity around the box, and direction of the thermal flux.

processing

- drying
- sawing
- grading

46. Equilibrium Moisture Content of Wood at High Temperatures

Simpson, William T. and Howard N. Rosen

Wood and Fiber 13(3): 150-158, 1981

This paper describes a method of extrapolating low-temperature EMC (equilibrium moisture content) data to high temperatures, compares these results with the literature, and presents EMC data from 212°F to 300°F in a form most useful for kiln control.

47. 5/4 Ponderosa Pine Shop Grade Cutting Yields

McDonald, Kent A., Pamela J. Giese, and Richard O. Woodfin

USDA For. Serv. Res. Pap. FPL 394, 1981

This paper discusses recently developed cutting yields for shop grades of ponderosa pine and presents relative value differences between lumber grades computed from a comprehensive data base.

48. Evaluating Humidity at Dry Bulb Temperatures above the Normal Boiling Point of Water—A Research Note

Rosen, Howard N. and William T. Simpson

Wood and Fiber 13(2): 97-101, 1981

The authors demonstrate an explicit method of calculating relative humidity that assumes wet bulb temperature is equivalent to adiabatic saturation temperature.

residues & energy

49. Increasing the Nutritive Value of Wood and Forest Products through Chemical and Physical Treatments

Satter, Larry D., Andrew J. Baker, and Merrill A. Millett

From: Upgrading Residues and By-products for Animals, pp. 62-76, CRC Press, 1981

This paper reviews some chemical and physical procedures used to partially delignify or modify the ligno-cellulose complex of wood residues and thus increase their digestibility.

50. The Contribution of Wood to the Energy Picture

Zerbe, John I.

From: Wood—An Alternate Energy Resource for Appalachian Industry and Institutions, Proceedings, School of Engineering, North Carolina State University, pp. 1-4, 1981

The author outlines wood's potential for energy production in the form of fuel chemicals and petrochemical substitutes.

51. Developments in Conversion Technology

Zerbe, John I.

From: Proceedings of the International Forestry Energy Meeting, Jan Erik Mattsson and Per Olov Nilsson, eds., No. 19, pp. 203-210, Project Forest Energy, Swedish University of Agricultural Sciences, Garpenberg, Sweden, 1981

The author discusses several means of converting forest-derived fuels to more desirable forms by the processes of charcoaling, densification, gasification, and liquefaction.

wood materials

52. Accelerated Aging of Phenolic-Bonded Hardboards and Flakeboards

River, Bryan H., Robert H. Gillespie, and Andrew J. Baker

USDA For. Serv. Res. Pap. FPL 393, 1981

Behavior of four exterior-type hardboard materials is compared to that of solid wood, plywood, and structural flakeboard.

53. Predicting Flakeboard Properties: Improvements in Bending Properties by Aligning a Mixture of Flakes

Geimer, Robert L.

From: Proceedings of the 14th Washington State University International Symposium on Particleboard, 1980, pp. 59-76, Pullman, Washington, 1981

This study sought to establish the relationship between properties of homogenous boards and boards made with a mixture of flake types in both the random and aligned configurations.

54. Thermal Characteristics of Thick Red Oak Flakeboard

White, Robert H. and E. L. Schaffer

USDA For. Serv. Res. Pap. FPL 407, 1981

This report covers thermal performance testing results for 1-3/16-inch red oak structural flakeboard and 1-1/8-inch softwood plywood.

cooperative research

Listed below are recent publications from universities or others involved in cooperative research with the Forest Products Laboratory. **Copies are not available from the Laboratory**, but may be obtained from the contacts listed following each publication.

Improved Saw Blade Material

Worzala, Frank J.

University of Wisconsin, College of Engineering, Department of Metallurgical and Mineral Engineering, Madison, WI 53706

Reverse Proof Loading as a Means of Quality Control in Lumber Manufacturing

Marin, Lisa A. and Frank E. Woeste

From: 1981 Transactions of the American Society of Agricultural Engineers

Virginia Polytechnic Institute and State University, Agricultural Engineering Department, Blacksburg, VA 24061

An Evaluation of the S-D-R Process for Converting Red Alder into Studs

Smith, W. Ramsay and T. F. Layton

University of Washington, College of Forest Resources, Seattle, WA 98195

Development of Saw-Dry-and Rip Concept for Paper Birch Studs and Furniture Squares

Erickson, Robert and Harland Peterson

University of Minnesota, College of Forestry, Department of Forest Products, St. Paul, MN 55108

Stud Yield from Air- and Kiln-dried Cottonwood Using the S-D-R System

Manwiller, Floyd G. and Tim Trachsel

Iowa State University, Department of Forestry, 251 Bessey Hall, Ames, IA 50011

Economic Potential of Dead Softwood Timber for Fiber and Wood Based Products

Maloney, T. M., E. M. Huffaker, and R. J. Mahoney

Washington State University, Department of Materials Science and Engineering, Wood Technology Section, Pullman, WA 99164

The Effect of Solvent Systems on the Volatilization of Pentachlorophenol from Treated Wood

Ingram, L. L., Jr., G. D. McGinnis, G. Jasperse, and L. R. Gjovik

From: Annual Meeting of the American Wood-Preservers' Association, 1981

American Wood-Preservers' Association, 7735 Old Georgetown Road, Bethesda, MD 20014

The Relative Amount of Pentachlorophenol Volatilization From Treated Wood

Ingram, L. L., G. D. McGinnis, and L. R. Gjovik

From: Annual Meeting of the American Wood-Preservers' Association, 1981

American Wood-Preservers' Association, 7735 Old Georgetown Road, Bethesda, MD 20014

The Valence State of Arsenic on Treated Wood

Woolson, E. A. and L. R. Gjovik

From: Annual Meeting of the American Wood-Preservers' Association, 1981

American Wood-Preservers' Association, 7735 Old Georgetown Road, Bethesda, MD 20014

Effect of Selected Clear Finishes on the Vaporization of Pentachlorophenol from Treated Wood

Ingram, L. L., G. D. McGinnis, and W. C. Feist

Information Series No. 21, 1980

Mississippi State University, Mississippi Forest Products Utilization Laboratory, Mississippi State, MS 39762

Chemistry of Oregonin

Hrutfjord, Bjorn F. and Ruth Luthi

University of Washington, College of Forest Resources, Seattle, WA 98195

Redox Chemistry of Metal-Catechol Complexes in Aprotic Media

1. Electrochemistry of Substituted Catcehols and Their Oxidation Products

Stallings, Martin D., M. M. Morrison, and D. T. Sawyer

Inorganic Chemistry 20:2655-2660, 1981

University of California, Riverside, Department of Chemistry, Riverside, CA 92521

Characteristics of Free Radicals in Wood

Hon, David N.-S., Geza Ifju, and William C. Feist

Wood and Fiber 12(2):121-130, 1980

Virginia Polytechnic Institute and State University, Department of Forest Products, Blacksburg, VA 24061

Isocyanate Binders for Particleboard Manufacture

Johns, W. E., T. M. Maloney, E. M. Huffaker, J. B. Saunders, and M. T. Lenz

In: Proceedings of 15th International Particleboard Symposium, 1981

Washington State University, Department of Materials Science and Engineering, Wood Technology Section, Pullman, WA 99164

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